CLAIMS

What is claimed is:

1. A method for depositing micro-lenses on a semiconductive circuit comprising the steps of:

    successively applying a plurality of coats of micro-lens suitable material to the surface of a semiconductive circuit wherein the current coat is imparted with a succeeding one of a plurality of lens formation patterns;

    removing unwanted portions of the current coat of micro-lens suitable material; and

    forming a plurality of micro-lenses from the remaining portion of the current coat of micro-lens suitable material.

2. The method of Claim 1 wherein the step of imparting the current coat with one of a plurality of lens formation patterns is accomplished by:

    placing a formation mask that embodies one of the plurality of lens formation patterns proximate to the current coat of micro-lens suitable material; and

    aligning the formation mask to the semiconductive circuit;

    irradiating the formation mask.

3. The method of Claim 1 wherein the plurality of lens formation patterns are alternate counterparts of each other.

4. A method for depositing micro-lenses on a semiconductive circuit comprising the steps of:

    applying a first coat of micro-lens suitable material to the surface of a semiconductive circuit;

    imparting a first lens formation pattern onto the first coat of micro-lens suitable material;

removing unwanted portions of the first coat of micro-lens suitable material;

forming a first plurality of micro-lenses from the remaining first coat of micro-lens suitable material;

applying a second coat of micro-lens suitable material to the semiconductive circuit;

imparting a second lens formation pattern to the second coat of micro-lens suitable material;

removing unwanted portions of the second coat of photo-resist; and

forming a second plurality of micro-lenses from the remaining second coat of micro-lens suitable material.

5. The method of Claim 4 wherein the first and second lens formation patterns are alternate counterparts of each other.

6. The method of Claim 5 wherein the first and second lens formation patterns comprise rectangular regions in a checkerboard pattern.

7. The method of Claim 6 wherein rectangular regions comprise broken corners to avoid continuity with neighboring regions.

8. The method of Claim 4 wherein the step of forming the first and second plurality of micro-lenses comprise the steps of:

raising the temperature of the micro-lens suitable material in order to relieve the surface tension thereof;

allowing the micro-lens suitable material to reflow in order to achieve a desired lens focal length; and

reducing the temperature of the micro-lens suitable material in order to preserve the achieved lens focal length.

9. The method of Claim 1 wherein the step of applying the first and second coats of micro-lens suitable material comprise the step of spin coating a micro-lens suitable material onto the semiconductive circuit.

10. The method of Claim 1 wherein the step of imparting the a first lens formation pattern onto the first coat of micro-lens suitable material comprises the steps of:

placing a first formation mask comprising the first lens formation pattern proximate to the first coat of micro-lens suitable material;

aligning the first formation mask relative to the semiconductive circuit; and

illuminating the first formation mask with radiation.

11. A method for depositing micro-lenses on a semiconductive circuit comprising the steps of:

applying a first coat of micro-lens suitable material to the surface of the semiconductive circuit;

imparting a first lens formation pattern onto the first coat of micro-lens suitable material;

removing unwanted portions of the first coat of micro-lens suitable material;

applying a second coat of micro-lens suitable material to the to the surface of the semiconductive circuit;

imparting a second lens formation pattern onto the second coat of micro-lens suitable material;

removing unwanted portions of the second coat of micro-lens suitable material; and

forming a plurality of micro-lenses from the remaining portions of the first and second coats of micro-lens suitable material.

12. A micro-lens structure comprising:

plurality of micro-lenses disposed proximate to radiation sensitive active regions formed in a semiconductive circuit located wherein each active region is formed within a boundary region perimeter and

wherein each micro-lens is formed from an island of micro-lens suitable material deposited onto the surface of the semiconductive circuit and wherein each island of micro-lens suitable material occupies an area within the boundary region larger than a resolution setback relative to the perimeter of the boundary region.

13. The micro-lens structure of Claim 12 wherein the islands of micro-lens suitable material are deposited onto the surface of the semiconductive material and wherein the micro-lenses are formed by:

successively applying a plurality of coats of micro-lens suitable material to the surface of a semiconductive circuit wherein the current coat is imparted with one of a plurality of lens formation patterns;

removing unwanted portions of the current coat of micro-lens suitable material; and

forming a plurality of micro-lenses from the remaining portion of the current coat of micro-lens suitable material.

14. The micro-lens structure of Claim 13 wherein the step of imparting the current coat with one of a plurality of lens formation patterns is accomplished by:

placing a formation mask that embodies one of the plurality of lens formation patterns proximate to the current coat of micro-lens suitable material; and

aligning the formation mask to the semiconductive circuit;

irradiating the formation mask.

15. The method of Claim 13 wherein the plurality of lens formation patterns are alternate counterparts of each other.

16. The micro-lens structure of Claim 12 wherein the islands of micro-lens suitable material are deposited onto the surface of the semiconductive material and wherein the micro-lenses are formed by:

    applying a first coat of micro-lens suitable material to the surface of the semiconductive circuit;

    imparting a first lens formation pattern onto the first coat of micro-lens suitable material;

    removing unwanted portions of the micro-lens suitable material;

    forming a first plurality of micro-lenses from the remaining portion of the first coat of micro-lens suitable material;

    applying a second coat of photo-resist to the semiconductive circuit;

    imparting a second lens formation pattern onto the second coat of micro-lens suitable material;

    removing unwanted portions of the micro-lens suitable material; and

    forming a second plurality of micro-lenses from the remaining portion of the second coat of micro-lens suitable material.

17. The micro-lens structure of Claim 16 wherein application of the first and second coats of from the remaining portion of the first coat of micro-lens suitable material is accomplished through a spin coating process.

18. The micro-lens structure of Claim 16 wherein the imparting of a first lens formation pattern onto the first coat of micro-lens suitable material is accomplished by:

    placing a first formation mask comprising the first lens formation pattern proximate to the first coat of micro-lens suitable material;

    aligning the first formation mask relative to the semiconductive circuit; and

    illuminating the first formation mask with radiation.

19. The micro-lens structure of Claim 16 wherein the first and second lens formation patterns are alternate counterparts of each other.

20. The micro-lens structure of Claim 19 wherein the first and second lens formation patterns comprise rectangular regions in a checkerboard pattern.

21. The micro-lens structure of Claim 20 wherein rectangular regions comprise broken corners to avoid continuity with neighboring regions.

22. The method of Claim 12 wherein the micro-lenses are formed by:

raising the temperature of the islands of micro-lens suitable material in order to relieve the surface tension thereof;

allowing the islands of micro-lens suitable material to reflow in order to achieve a desired lens focal length; and

reducing the temperature of the islands of micro-lens suitable material in order to preserve the achieved lens focal length.

23. A semiconductive circuit image sensor comprising:

surface;

plurality of radiation sensitive active regions disposed in the surface wherein each active regions is encompassed by a boundary perimeter;

sensing circuitry to sense the state of the plurality of active regions; and

plurality of micro-lenses disposed proximate to and coincident with the plurality of active regions

wherein each micro-lens is formed from an island of micro-lens suitable material deposited onto the surface of the semiconductive circuit and wherein each island of micro-lens suitable material occupies an area within the boundary region larger than a resolution setback relative to the perimeter of the boundary region.

24. The micro-lens structure of Claim 23 wherein the islands of micro-lens suitable material are deposited onto the surface of the semiconductive material and wherein the micro-lenses are formed by:

successively applying a plurality of coats of micro-lens suitable material to the surface of a semiconductive circuit wherein the current coat is imparted with one of a plurality of lens formation patterns;

removing unwanted portions of the current coat of micro-lens suitable material; and

forming a plurality of micro-lenses from the remaining portion of the current coat of micro-lens suitable material.

25. The micro-lens structure of Claim 24 wherein the step of imparting the current coat with one of a plurality of lens formation patterns is accomplished by:

placing a formation mask that embodies one of the plurality of lens formation patterns proximate to the current coat of micro-lens suitable material; and

aligning the formation mask to the semiconductive circuit;

irradiating the formation mask.

26. The method of Claim 24 wherein the plurality of lens formation patterns are alternate counterparts of each other.

27. The semiconductive image sensor of Claim 23 wherein the islands of micro-lens suitable material are deposited onto the surface of the semiconductive material and wherein the micro-lenses are formed by:

applying a first coat of micro-lens suitable material to the surface of the semiconductive circuit;

imparting a first lens formation pattern onto the first coat of the micro-lens suitable material;

removing unwanted portions of the first coat of micro-lens suitable material;

forming a first plurality of micro-lenses from the remaining portion of the first coat of micro-lens suitable material;

applying a second coat of the micro-lens suitable material to the semiconductive circuit;

imparting a second lens formation pattern onto the second coat of the micro-lens suitable material;

removing unwanted portions of the second coat of micro-lens suitable material; and

forming a second plurality of micro-lenses from the remaining portion of the second coat of micro-lens suitable material.

28. The micro-lens structure of Claim 27 wherein application of the first and second coats of micro-lens suitable material is accomplished through a spin coating process.

29. The micro-lens structure of Claim 27 wherein imparting a first lens formation pattern onto the first coat of micro-lens suitable material is accomplished by:

placing a first lens formation mask comprising the first lens formation pattern proximate to the first coat of micro-lens suitable material;

aligning the first lens formation mask relative to the semiconductive circuit; and

illuminating the first lens formation mask with radiation.

30. The micro-lens structure of Claim 27 wherein the first and second lens formation patterns are alternate counterparts of each other.

31. The micro-lens structure of Claim 30 wherein the first and second lens formation patterns comprise rectangular regions in a checkerboard pattern.

32. The micro-lens structure of Claim 31 wherein rectangular regions comprise broken corners to avoid continuity with neighboring regions.